

WHAT IS CLAIMED IS:

1. A hard disk drive system comprising:
 - a hard disk drive comprising a channel;
 - a channel detector adapted to receive a first signal representing a channel sequence
 - 5 from the channel, and to produce a first detected sequence based on the first signal, wherein the first detected sequence comprises a plurality of symbols;
 - a decoder comprising
 - an error-correction decoder adapted to produce first data based on the first
 - detected sequence when a number of symbols in error in the first detected sequence is
 - 10 less than, or equal to, a predetermined number, and to assert a failure indication when the number of symbols in error in the first detected sequence is greater than the predetermined number; and
 - a controller adapted, when the error-correction decoder asserts the failure
 - indication for the first detected sequence, to
 - 15 cause the channel detector to receive a second signal representing the channel sequence from the channel, and to produce a second detected sequence based on the second signal, wherein the second detected sequence comprises a plurality of symbols, and
 - identify corresponding symbols of the first and second detected
 - 20 sequences that differ;
 - wherein the decoder produces second data based on the symbols identified by the controller and at least one of the first and second detected sequences.
2. The hard disk drive system of claim 1, wherein the error-correction decoder is
- 25 further adapted to produce the second data based on the symbols identified by the controller and at least one of the first and second detected sequences.
3. The hard disk drive system of claim 1, wherein:
 - the controller is further adapted to generate a candidate sequence based on the first
 - 30 and second detected sequences; and

the error-correction decoder is further adapted to produce the second data based on the candidate sequence.

4. The hard disk drive system of claim 3, wherein the controller is further adapted to generate the candidate sequence by replacing k of the identified symbols of one of the first and second detected sequences with k respective corresponding symbols of the other of the first and second detected sequences, wherein k is greater than, or equal to, one.

5. The hard disk drive system of claim 1, wherein the error-correction decoder is a Reed-Solomon decoder.

6. The hard disk drive system of claim 1, wherein the channel is selected from the group comprising:

a magnetic recording channel; and

an optical recording channel.

7. The hard disk drive system of claim 1, further comprising:
an interface circuit adapted to output the second data.

8. A hard disk drive system comprising:
channel means for storing data;
channel detector means for receiving a first signal representing a channel sequence from the channel, and for producing a first detected sequence based on the first signal, wherein the first detected sequence comprises a plurality of symbols;
decoder means for decoding the first detected sequence, the decoder means comprising

error-correction decoder means for producing first data based on the first detected sequence when a number of symbols in error in the first detected sequence is less than, or equal to, a predetermined number, and for asserting a failure indication when the number of symbols in error in the first detected sequence is greater than the predetermined number; and

controller means for, when the error-correction decoder asserts the failure indication for the first detected sequence,

causing the channel detector means to receive a second signal representing the channel sequence from the channel, and producing a second detected sequence based on the second signal, wherein the second detected sequence comprises a plurality of symbols, and

identifying corresponding symbols of the first and second detected sequences that differ;

wherein the decoder means produces second data based on the symbols identified by the controller means and at least one of the first and second detected sequences.

9. The hard disk drive system of claim 8, wherein the error-correction decoder means produces the second data based on the symbols identified by the controller means and at least one of the first and second detected sequences.

10. The hard disk drive system of claim 8, wherein:
the controller means generates a candidate sequence based on the first and second detected sequences; and
the error-correction decoder means produces the second data based on the candidate sequence.

11. The hard disk drive system of claim 10, wherein the controller means generates the candidate sequence by replacing k of the identified symbols of one of the first and second detected sequences with k respective corresponding symbols of the other of the first and second detected sequences, wherein k is greater than, or equal to, one.

12. The hard disk drive system of claim 8, further comprising:
interface circuit means for outputting the second data.

13. An apparatus comprising:

a channel detector adapted to receive a first signal representing a channel sequence from a channel, and to produce a first detected sequence based on the first signal, wherein the first detected sequence comprises a plurality of symbols; and

5 a decoder comprising

an error-correction decoder adapted to produce first data based on the first detected sequence when a number of symbols in error in the first detected sequence is less than, or equal to, a predetermined number, and to assert a failure indication when the number of symbols in error in the first detected sequence is greater than the
10 predetermined number; and

a controller adapted, when the error-correction decoder asserts the failure indication for the first detected sequence, to

cause the channel detector to receive a second signal representing the channel sequence from the channel, and to produce a second detected
15 sequence based on the second signal, wherein the second detected sequence comprises a plurality of symbols, and

identify corresponding symbols of the first and second detected sequences that differ;

wherein the decoder produces second data based on the symbols identified by the
20 controller and at least one of the first and second detected sequences.

14. The apparatus of claim 13, wherein the error-correction decoder is further adapted to produce the second data based on the symbols identified by the controller and at least one of the first and second detected sequences.

25 15. The apparatus of claim 13, wherein:

the controller is further adapted to generate a candidate sequence based on the first and second detected sequences; and

the error-correction decoder is further adapted to produce the second data based on
30 the candidate sequence.

16. The apparatus of claim 15, wherein the controller is further adapted to generate the candidate sequence by replacing k of the identified symbols of one of the first and second detected sequences with k respective corresponding symbols of the other of the first and second detected sequences, wherein k is greater than, or equal to, one.

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17. The apparatus of claim 13, wherein the error-correction decoder is a Reed-Solomon decoder.

18. The apparatus of claim 13, wherein the channel is selected from the group comprising:

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a magnetic recording channel;
an optical recording channel;
a wired communications channel;
a wireless communications channel; and
an optical communications channel.

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19. An integrated circuit comprising the apparatus of claim 13.

20. An apparatus comprising:

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channel detector means for receiving a first signal representing a channel sequence from a channel, and for producing a first detected sequence based on the first signal, wherein the first detected sequence comprises a plurality of symbols; and

decoder means for decoding data, the decoder means comprising

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error-correction decoder means for producing first data based on the first detected sequence when a number of symbols in error in the first detected sequence is less than, or equal to, a predetermined number, and for asserting a failure indication when the number of symbols in error in the first detected sequence is greater than the predetermined number; and

controller means for, when the error-correction decoder asserts the failure indication for the first detected sequence

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causing the channel detector means to receive a second signal representing the channel sequence from the channel, and to produce a second detected sequence based on the second signal, wherein the second detected sequence comprises a plurality of symbols, and

5 identifying corresponding symbols of the first and second detected sequences that differ;

wherein the decoder means produces second data based on the symbols identified by the controller means and at least one of the first and second detected sequences.

10 21. The apparatus of claim 20, wherein the error-correction decoder means produces the second data based on the symbols identified by the controller means and at least one of the first and second detected sequences.

22. The apparatus of claim 20, wherein:
15 the controller means generates a candidate sequence based on the first and second detected sequences; and
the error-correction decoder means produces the second data based on the candidate sequence.

20 23. The apparatus of claim 22, wherein the controller means generates the candidate sequence by replacing k of the identified symbols of one of the first and second detected sequences with k respective corresponding symbols of the other of the first and second detected sequences, wherein k is greater than, or equal to, one.

25 24. An integrated circuit comprising the apparatus of claim 20.

25. A method comprising:
receiving a first signal representing a channel sequence from a channel;
producing a first detected sequence based on the first signal, wherein the first detected
sequence comprises a plurality of symbols;
5 producing first data based on the first detected sequence when a number of symbols
in error in the first detected sequence is less than, or equal to, a predetermined number;
asserting a failure indication when the number of symbols in error in the first detected
sequence is greater than the predetermined number;
when the failure indication is asserted for the first detected sequence,
10 receiving a second signal representing the channel sequence from the channel,
producing a second detected sequence based on the second signal, wherein the
second detected sequence comprises a plurality of symbols, and
identifying corresponding symbols of the first and second detected sequences
that differ; and
15 producing second data based on the identified symbols and at least one of the first and
second detected sequences.

26. The method of claim 25, wherein producing the second data comprises:
generating a candidate sequence based on the first and second detected sequences;
20 and
producing the second data based on the candidate sequence.

27. The method of claim 26, wherein generating the candidate sequence
comprises:
25 replacing k of the identified symbols of one of the first and second detected sequences
with k respective corresponding symbols of the other of the first and second detected
sequences, wherein k is greater than, or equal to, one.

28. The method of claim 25, wherein the channel sequence is encoded using a
30 Reed-Solomon code.

29. The method of claim 25, wherein the channel is selected from the group comprising:

a magnetic recording channel;
an optical recording channel;
5 a wired communications channel;
a wireless communications channel; and
an optical communications channel.

30. A computer program embodying instructions executable by a computer, comprising:

10 producing a first detected sequence based on a first signal representing a channel sequence from a channel, wherein the first detected sequence comprises a plurality of symbols;

15 producing first data based on the first detected sequence when a number of symbols in error in the first detected sequence is less than, or equal to, a predetermined number;

asserting a failure indication when the number of symbols in error in the first detected sequence is greater than the predetermined number;

when the failure indication is asserted for the first detected sequence,

20 producing a second detected sequence based on a second signal representing the channel sequence from the channel, wherein the second detected sequence comprises a plurality of symbols, and

identifying corresponding symbols of the first and second detected sequences that differ; and

25 producing second data based on the identified symbols and at least one of the first and second detected sequences.

31. The computer program of claim 30, wherein producing the second data comprises:

generating a candidate sequence based on the first and second detected sequences;

30 and

producing the second data based on the candidate sequence.

32. The computer program of claim 31, wherein generating the candidate sequence comprises:

replacing k of the identified symbols of one of the first and second detected sequences
5 with k respective corresponding symbols of the other of the first and second detected sequences, wherein k is greater than, or equal to, one.

33. The computer program of claim 30, wherein the channel sequence is encoded using a Reed-Solomon code.

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